Signal Training Bulletin

COMMITTEE G—Education & Training
Communication & Signal Division, AAR

E-10 Highway Crossing Bell

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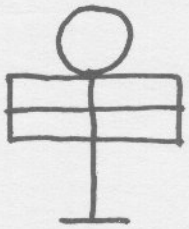
The Signalman's Journal

Definition: An audible signal at a highway grade crossing to give warning of the approach of trains.

Symbol:



Description: There are many different kinds of bells available to the railroad industry. The major variations in the bells are size, degree of loudness and operating voltages. The most commonly used bell is one that operates on direct current at approximately 10 volts. Many modern bells are constructed of a rust proof cast aluminum housing with a steel gong.

The basic components of a bell are illustrated in Figure 1.

Purpose and Application: The main purpose of a crossing bell is to inform pedestrians and bicycylists of an approaching train. A bell is normally installed at crossings where pedestrians or bicycle traffic is likely to occur.

General Information: A bell is firmly fixed to the top of a crossing signal mast in place of the pinnacle or to a side mount bracket using the set screw bolt(s) provided. The bell must be mounted with the gong parallel to the highway or street. This is because the maximum sound of the bell emanates from the rim of the gong.

Many styles of bells contain an arc suppressing rectifier or capacitor in the operating circuit. They both minimize operating contact arcing and pitting, and reduce radio interference that would occur when the operating contacts break. Because the rectifier is polarity sensitive, it is necessary to insure that polarity is correct before connecting external wires, otherwise damage will occur to the rectifier elements.

A crossing bell should be audible on a clear day with wind and extraneous noises negligible, for a distance of 1,000 feet. Normal operation of a bell is between 100-325 strokes per minute and is adjusted by changing the distance between the operating contacts.

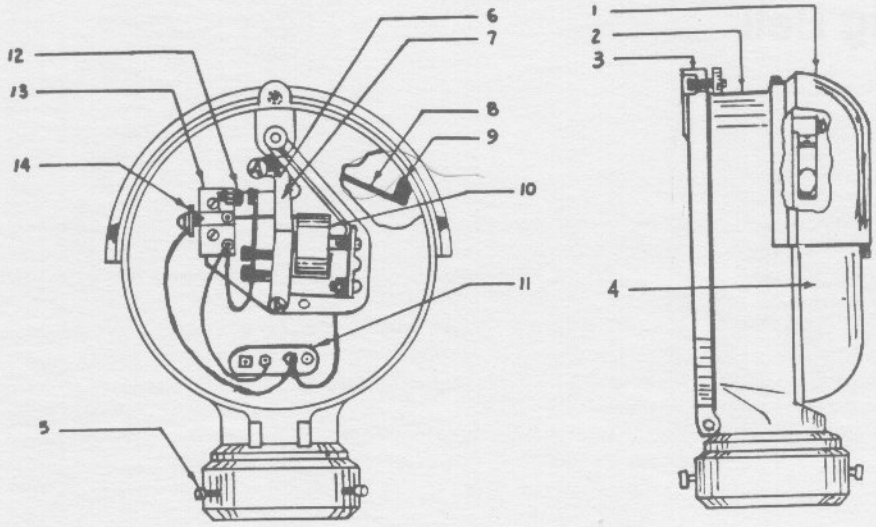


Figure 1 shows diagrams of crossing bell with identification of the parts.

IDENTIFICATION

1. Bell Hood
2. Bell Housing
3. Bell Door
4. Gong
5. Set Screw
6. Mechanical Linkage
7. Arm Assembly
8. Clapper Arm
9. Clapper
10. Coil
11. Terminal Block
12. Operating Contact
13. Contact Block
14. Arc Suppressing Rectifier

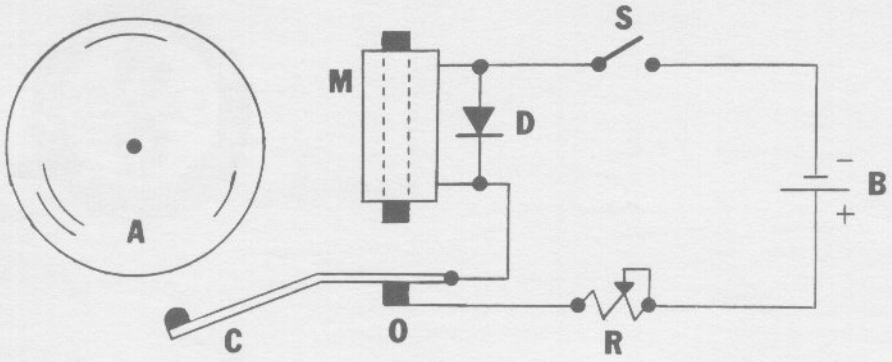


Figure 2 is a schematic diagram of the operating parts and circuit for a highway crossing bell.

A - Gong

B - Battery

C - Clapper (hammer) Arm

D - Arc Suppressing Rectifier

M - Electromagnet

O - Operating Contact

R - Rheostat

S - Switch

Good maintenance practices include the following:

1) Periodically clean the operating compartment of dust and dirt.

2) Periodically clean and adjust the operating contacts.

3) Oil the mechanical linkage of the bell with a light, all-temperature oil in accordance with standard practice.

4) Adjust the normal operating voltage at the specified value as indicated on the bell (normally 10-12 volts, dc.).

5) Insure that internal wires do not interfere with normal operation of the bell.

6) Periodically inspect clapper (hammer) and gong for wear. Rotate gong as necessary to prevent excessive wear on one spot of the gong.

7) Check that bell door gasket is in good condition to seal the electrical and mechanical parts from weather.

8) Paint all sides of housing and outside of gong in accordance with standard practice. New types of bells that consist of aluminum housings and steel gongs only require that the gong be painted.

Detailed Operation: The detailed operation of a crossing bell will be explained by using a simplified schematic of a bell circuit (Figure 2).

When switch (S) is closed, current flows from the negative battery terminal through the switch, electromagnet (M), operating contact (O), rheostat (R), and back to the positive battery terminal. Rectifier (D) is reverse biased at this instant and will not pass current.

Current flow through the elctromagnet creates an electromagnetic field. This field attracts the hinged clapper arm (C) to the electromagnet and causes the clapper to hit the gong.

When the clapper arm is attracted to the electromagnet, operating contact (O) breaks and opens the circuit. This de-energizes the electromagnet and allows the clapper arm to settle back on the operating contact. When the clapper arm and the operating contact make, the electromagnet is energized and the cycle is repeated until switch (S) is opened.

Each time the operating contact is opened the energy stored in the field about the electromagnet must be dissipated. Without the rectifier in the circuit the collapsing field would cause an arc across the operating contacts. This arc could create contact pitting and radio interference.

With the rectifier in the circuit, the currrent flow generated by the collapsing field will be routed away from the operating contacts. Current will flow out of the bottom of the electromagnet, through the now-forward-biased rectifier and back into the top of the electromagnet. Energy stored in the field about the electromagnet will be dissipated in the resistance of the electromagnet windings.

Rheostat (R) is used to adjust the voltage on the electromagnet and to limit current flow from the battey in the event the rectifier shorts.

Many railroads have instructions outlining installation, maintenance, inspection and safety procedures with regard to crossing bells. It is most important that you become familiar with the requirements of your company.

Note: This bulletin is for general information only. For specific applications consult the rules, standards and instructions published by your railroad.